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Recent Advances in Energy and Environmental Management

- Proceedings of the 8th International Conference on Energy & Environment (EE '13)
- Proceedings of the 7th International Conference on Geology and Seismology (GES '13)
- Proceedings of the 1st International Conference on Environmental Management in Construction (EMC '13)
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Rhodes Island, Greece, July 16-19, 2013

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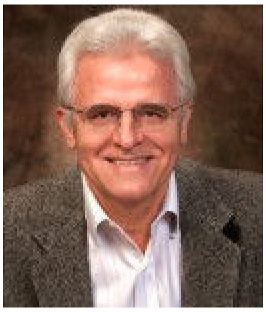
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Plenary Lecture 1

Energy and Environmental Landscape: The Laws of Thermodynamics and Nature



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Abstract: Energy and Environmental landscape could be substantially enhanced with improved efficiency and diversification of energy sources, devices and processes. The fundamental Laws of Thermodynamics and comprehensive analysis and optimization are the most effective ways for the improvements and could lead to innovative development.The fundamental Laws of Nature are exceptionally simple but they appear in exceptionally many different forms, which explain universality and unity of simplicity and complexity, but also difficulties to recognize simplicity in complex diversity.

The philosophic axiom "causa aequat effectum" [the cause is adequate to the effect] traced to ancient philosophers, represents the most universal and fundamental law of nature, including existence and future, i.e. past and future transformations. Furthermore, the phenomenological Laws of Thermodynamics have much wider, including philosophical significance and implication, than their simple expressions based on the experimental observations – they are the Fundamental Laws of Nature. They are defining and unifying our comprehension of all existence in universe (all natural and man-made systems defined by their properties and processes) and all changes in time (all processes, including life), which are in turn caused by mass-energy transfer, from one system or subsystem to another, due to non-uniform mass-energy distribution in space and time.

Therefore, advances in energy conversion and utilization technologies and increase in efficiency, including computerized control and management, contribute to energy efficiency and conservation, increase in safety, and reduction of related environmental pollution. Actually, per capita energy use in the U.S. and other developed countries is being reduced in recent years. However, the increase of World's population and development of many underdeveloped and fast developing and very populated countries, like China, India and others, will influence continuous increase of the World energy consumption and related impact on the environment. After all, in the wake of a short history of fossil fuels' abundance and use (a blip on a human history radar screen), the life may be happier after the fossil fuel era!

Brief Biography of the Speaker: Milivoje M. Kostic, Ph.D., P.Eng., Professor of Mechanical Engineering at Northern Illinois University, is a notable researcher and scholar in energy fundamentals and applications, including nanotechnology, with emphasis on conservation, environment and sustainability. He graduated with the University of Belgrade highest distinction (the highest GPA in ME program history), obtained Ph.D. at University of Illinois at Chicago as a Fulbright scholar, appointed as NASA faculty fellow, and Fermi and Argonne National Laboratories faculty researcher. Professor Kostic also worked in industry and has authored a number of patents and professional publications, including invited articles in prestigious energy encyclopedias. He has a number of professional awards and recognitions, is a frequent plenary speaker at international conferences and at different educational and public institutions, as well as member of several professional societies and scientific advisory boards. More at www.kostic.niu.edu.

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Plenary Lecture 2

Emphasis on Sustainability Concepts for Analyzing the Disconnection Process Energy Transformation in the Generator Circuit-Breaker



Associate Professor Cornelia Aida Bulucea
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ROMANIA
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Abstract: The sustainability concepts of science describe aspects of the universe. A convincing example of the usefulness of exergy and embodied energy for analyzing systems which transform energy is the generator circuit-breaker (GCB) disconnection process. Nowadays, the electric connection circuits of power plants, based on fossil fuels as well as renewable sources, entail GCBs at the generator terminals, since the presence of that electric equipment offers many advantages related to the sustainability of a power plant. A generator circuit-breaker is located between the generator and the main step-up transformer, this location influencing the operating conditions of GCBs. The interruption requirements of a GCB are significantly higher than for the distribution network circuit-breakers. A generator circuit-breaker must be capable of interrupting not only the high symmetrical fault current, but also the higher asymmetrical faults currents resulting from high aperiodic pulsating components of the fault current. This way arises a sustainability requirement for generator circuit-breakers which are subjected to a unique demanding condition, called delayed current zeros. The manner in which the various factors influence the delay lasting of the first zero passing of the short-circuit current are investigated. Further in this study it is emphasized that although the phenomena produced in the electric arc at the terminals of the circuit-breaker are complicated and not completely explained, the concept of exergy is useful in understanding the physical phenomena. Investigations of electrics show that the limits between the microscopic and macroscopic phenomena are fragile and certain phenomena could be studied in related frames of work. The electric arc that occurs during the interruption processes in a circuit-breaker can be studied as a very high temperature (up to 50,000 K) continuous plasma discharge, and thermodynamic parameters must be taken into consideration; alternatively it could be seen as an electric conductor of a resistance depending on the current intensity (under a constant low voltage) and studied within the Faraday's macroscopic theory. Electric arc interruption is of great importance, because an uncontrolled electrical arc in the apparatus could become destructive since, once initiated, an arc will draw more and more current from a fixed voltage supply until the apparatus is destroyed. However, the appearance of an electric arc at the terminals of the circuit-breaker should not be necessarily seen as a damaging phenomenon since if the electric arc would not appear the network embedded magnetic energy would be converted to the energy of the circuit electric field, leading further to high over-voltages in the network. Moreover, due to the arc exergy, the aperiodic pulsating component of the short-circuit current decreases very quickly, starting with the moment of contact separation.

Brief Biography of the Speaker: Cornelia Aida Bulucea is currently an Associate Professor in Electrotechnics, Electrical Machines and Environmental Electric Equipment in the Faculty of Electrical Engineering, University of Craiova, Romania. She is graduate from the Faculty of Electrical Engineering Craiova and she received the Ph.D degree from Bucharest Polytechnic Institute. In Publishing House she is author of four books in electrical engineering area. Research work is focused on improved solutions for electrical networks on basis of new electric equipment, and environmental impact assessment of electric transportation systems. She has extensive experience in both experimental and theoretical research work, certified by over 70 journal and conference research papers and 15 research projects from industry. She has held in the Association for Environment Protection OLTENIA and she is a regular invited keynote lecture for environmental engineering symposia organized by Chamber of Industry and Commerce OLTENIA. Due to WSEAS recognition as huge scientific Forum she participated over time in nineteen WSEAS International Conferences, presenting papers and chairing sessions. She was Plenary Lecturer in the 5th IASME/WSEAS International Conference on ENERGY&ENVIRONMENT (EE'10), held by the University of Cambridge, UK, February 23-25, 2010, in the 4th IASME/WSEAS International Conference on ENERGY&ENVIRONMENT (EE'09),), held by the University of Cambridge, Cambridge UK, February 24-26, 2009 and in the 8th WSEAS International Conference on POWER SYSTEMS (PS'08), held by the University of Cantabria, Santander, Spain, September 23-25, 2008. She is very proud by her over 30 papers published in the WSEAS Conferences Books and journals.

Plenary Lecture 3

New Energy (Fuel) Will Save Our Earth - Dimethyl Ether (DME): A Clean Fuel for the 21st Century



Associate Professor Kaoru Takeishi
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Abstract: Dimethyl ether (DME) is the smallest ether, and its chemical formula is CH_3OCH_3. DME usually exists as gas, but it is easy to liquefy by cooling at -25°C at atmospheric pressure and by pressurizing under 5 atm at room temperature. Therefore, DME is easy to handle like liquefied petroleum gas (LPG). DME will be used as fuel of substitute of LPG. In China, DME is mixed into LPG and used as a domestic fuel. Cetane number of DME is 55-60, so DME will be used as a diesel fuel. In Japan, China, Sweden and so on, DME buses and trucks are testing on public roads. DME does not contain poisonous substances, and it burns with no particulate matters (PM), no sulphur oxides (SOx), and less nitrogen oxides (NOx). Therefore, DME is expected as a clean fuel for the 21st century. DME is able to replace light oil and LPG, and its physical properties are similar to those of LPG. It is possible that DME infrastructures will be settled more rapidly than hydrogen, because existing LPG infrastructures can be used for DME. On the other hand, it is expected that fuel cell is one of the methods to restrain the global green effect. Steam reforming of methane, LPG, gasoline, and methanol is actively researched and developed as hydrogen supply methods for the fuel cells. Methanol steam reforming is easy to perform at around 250-300°C. However, the toxicity of methanol is high, and its infrastructure is not well developed. The infrastructures for natural gas, LPG, and gasoline are well established, but those steam reforming are difficult even at high temperatures around 800°C, and they contain sulphur resulting in catalyst poisoning. DME is expected as excellent hydrogen carrier and hydrogen storage, because DME will be easy to reform into hydrogen if there will be excellent catalysts of DME steam reforming. Therefore, I have been studying on DME steam reforming for hydrogen production, and researching on catalysts for DME steam reforming and DME synthesis.

The results of steam reforming of DME over several catalysts suggested the following facts: H_2 production with steam reforming of DME consists of two steps. The first step is hydrolysis of DME into methanol. The second step is steam reforming of methanol that produces H_2 and CO_2. The rate determining step is hydrolysis of DME into methanol. The copper alumina catalysts prepared by the sol-gel method are excellent for H_2 production by steam reforming of DME. The reason is that γ-Al_2O_3 for the hydrolysis and Cu for methanol-steam reforming are co-existing closely on the catalyst surface. The consecutive reactions smoothly occur. Addition of Zn, Mn, or Fe into Cu(30wt.%)/Al_2O_3 activates steam reforming of DME. The Cu-Zn(29-1wt.%)/Al_2O_3 catalyst shows the excellent activity of DME steam reforming; the DME conversion is 95%, H2 yield is 95%, and CO concentration was 0.8 mol.%. I have developed a new catalyst for H_2 production from DME, and the catalyst give us a great potential for H_2 supply from DME.

I have also developed catalysts for direct DME synthesis from syngas (mixture of hydrogen and carbon monoxide). The catalysts are prepared by the sol-gel method, and the surface of the catalysts is optimum for direct DME synthesis. Copper sites for methanol synthesis from syngas, γ-Al_2O_3 sites for dehydration of methanol into DME, and copper sites for water-gas shift reaction from H_2O & CO into H_2 & CO_2, are co-existing closely on the catalyst surface. The consecutive reactions (methanol synthesis, methanol dehydration, and water-gas shift reaction) smoothly occur, and DME is produced fast. Therefore, these catalysts will be very effective for new energy society of DME and hydrogen.

Brief Biography of the Speaker:
Apr. 2009 - Present: Associate Professor (Lecturer), Faculty of Engineering, Shizuoka University
Oct. 1994 - Mar. 2009: Assistant Professor, Faculty of Engineering, Shizuoka University
Mar. 2005: Doctor of Engineering, Tokyo Institute of Technology
Apr. 1989 - Sep. 1994: Assistant Professor, Junior College of Engineering, Shizuoka University
Apr. 1987 - Mar. 1989: Researcher, Gotemba R&D Laboratory, Dow Chemical Japan

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Apr. 1985 - Mar. 1987: Master Course of Electronic Chemistry, Tokyo Institute of Technology (Master of Science)
Apr. 1981 - Mar. 1985: Undergraduate Course of Chemistry, Science University of Tokyo (Bachelor of Science)
My main research field is catalysis chemistry. Now, I have specially been working for catalyst development for new fuels such as dimethyl ether (DME) and hydrogen.

Plenary Lecture 4

Formaldehyde Emission Modeling Depending on Plywood Thickness at Different Testing Temperatures




Professor Loredana Anne-Marie Badescu
Dr. Octavia Zeleniuc
Department of Wood Processing and Design of Wood Products
Faculty of Wood Engineering/Wood Machining
Center of Excellence (CCSPL)
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Abstract: This paper presents a mathematical model for determining formaldehyde emission at plywood panels with different thickness, when the temperature is variation on the test condition. Modeling was performed based on the experimental results obtained at the determination of formaldehyde emission with the bottle method and results are a set of diagrams which can be appreciated the content and formaldehyde emission of plywood used in furniture construction.

Brief Biography of the Speaker:
Loredana Anne-Marie Badescu
-Professor dr eng at Transilvania University of Brasov, Romania, Wood Engineering Faculty
-33 years teaching experience in the field of Wood processing
-Wood Machining Center of Excellence founder (president from 2002 to present)
-Coordinated 5 successful national projects and acted as a collaborator in other 40 national and international research projects (LdV, CEEPUS, FP6, FP7)
-Coordinator in National Programme Researches PNII „Modelling to Sustainable Promotion of Wooden Products and Technologies with Impact on the Quality Environment.” The project aims to create and consolidate a package of procedures destined to reduce the entropic pressure over a basic component of the environment in the same time suggesting a model for eco-socio and economical sustainability. At present coordinator of two projects proposed in FP7 and ANR Bilateral programs Fr-Ro “Advancing knowledge on the assessment, verification, testing and modelling of noise, dust and VOC emissions from wood processing to promote a sustainable management of the wood chain”: and „Advanced knowledge, Modelling and Optimization on Structural wood components, of new ECO-products made with Welded WOOD dowels, with direct impact on environment in order to promote sustainable development”
- author of more than 150 papers published at national and international level, unique author for six books. And co-author in other 4 books.

Octavia Zeleniuc
Graduate of Wood Engineering Faculty, “TRANSILVANIA” University of Brasov, ROMANIA.
Senior research scientist grade II at National Institute of Wood Bucharest, between 1986 and 2004. In this institute, as head of laboratory, her work has been focused on wood drying and wood preservation. She received her Ph.D. in industrial engineering, in the field of beech timber drying, in 2000.
Since 2004, she has joined the Faculty of Wood Engineering having the competences in timber technology, wood treatments (drying and preservation) and wood testing: laboratory and field tests for wood durability evaluation, physical, mechanical properties, formaldehyde emissions from wood based products. She was Member in Management Committee COST E22 and COST E37 (2000-2008) and since 2010 she coordinates the activity of VOC & formaldehyde laboratory at RTD Research Institute Brasov.
Author and co-author in over 70 scientific articles published in Journals and in the Proceedings of National and International Conferences: Romania, Canada, Greece, France, Portugal, Slovenia, Slovakia, UK, etc. Papers presented in some WSEAS Conferences in Brasov (2009), Tenerife (2009), Malta (2010) and Angers (2011).

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Plenary Lecture 5

Incidence of Cutting Fluids on the Machining Process, the Operator and the Work Environment



Professor Constantin Buzatu
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Manufacturing Technology Department
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Abstract: Currently over 60% of manufacturing processes of various metal parts are made by cutting using various methods, in the presence of cutting fluids transmitted in the work area from central station. With all the advantages on quality shows they obtained, unless management is done properly, cutting fluids can cause some disadvantages of the process, but also negative effects on environment and health security operator. The paper analyzes positive and negative effects of using cutting fluids on the process, the operator and the environment based on research done by the authors.

Brief Biography of the Speaker: Constantin Buzatu is Professor at the Faculty of Technological Engineering and Manufacturing Technology Department of Transilvania University of Brasov, Romania. He graduated in 1972 and he obtained his Ph.D. in the field of accuracy of machining processes. His research interests are in Manufacturing engineering processes, Automation in industry, Performance measurement and management, Education technology. He is author and co-author of seven books and more than 150 papers in national and international conferences. Also he has been research manager for several research grants from Ministry of Education of Romania, and for contracts with factories in industry to introduce new technologies in producing workpieces and to improve their reliability. He was member of technical program committee of some conferences and chairman of local and international conferences. He has been scientific reviewer for International Conferences and independent evaluator for Grant National Competitions.

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Plenary Lecture 6

Significance of Structural Health Monitoring in Cultural Heritage Structures



Associate Professor Ahmet Turer
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Civil Engineering Department
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Abstract: Monitoring of modern and special civil engineering structures, extraordinary ones such as long span bridges, high rise buildings, deep tunnels, are under continuous control by measurement devices; which is commonly referred as Structural Health Monitoring (SHM). The main concept behind SHM is to place necessary amount of gages at critical locations in a structure to evaluate its status in time and even generate warning signals in the form of audible alarms or SMS messages if measurements exceed predefined damage limits; which is commonly defined as smart structures. This technology has also been implemented on cultural heritage structures since they are irreplaceably valuable and very important structures. This lecture gives a brief background on SHM and application of monitoring techniques on cultural heritage structures while putting emphasis on commonly used sensors and datalogger types. Interesting monitoring examples will be provided showing detectable structural changes on historic structures that undergo restoration work and could have been otherwise lead to undesirable effects if monitoring was not performed. Other monitoring types of short monitoring for dynamic testing will be discussed and relevance to finite element model calibration will be discussed.

Brief Biography of the Speaker: Dr Ahmet Turer received his B.S. (High Honor, 1993) in Civil Engineering from Middle East Technical University (METU) in Ankara, then M.S. (1997) and PhD (2000) degrees from University of Cincinnati (UC), Ohio-USA. He worked as a structural engineer and project planner between 1993-1995 in Turkey as well as research assistant and part-time structural engineer in USA. Assoc. Prof. Dr. Ahmet Turer has been a full time faculty member at METU Civil engineering department since 2000 and specialized on structural analysis, monitoring, condition evaluation of historic structures and bridges. He is the author of close to 100 conference and international pier reviewed journal papers. He received science award from Istanbul Kultur University in 2007 for his innovative work on developing strengthening techniques using scrap tires for non-engineered masonry rural houses self-constructed by poor occupants. He serves as the head of Special and Tall Structures Research Center at METU.

Plenary Lecture 7

Heavy Metal Contamination of Soils and Remediation Technologies



Associate Professor Dilek Turer
Department of Geological Engineering
Hacettepe University
Turkey
E-mail: dturer@hacettepe.edu.tr

Abstract: Soils can contain heavy metals naturallybecause of their metal rich source rock but the main reason for the high concentrations observed in soils is the anthropogenic sources. These sources are mine tailing, usage of leaded gasoline and paints, pesticides, fertilizers, and industrial wastes. The most commonly found heavy metals in contaminated sites are lead, zinc, copper, chromium, nickel, and mercury. Contaminated soils can result in some health problems in humans through breathing of contaminated soils as small dust particles in the air when they are disturbed and also through food chain and contaminated groundwater.Besides isolation of the contaminated soils as a method to prevent the mobility of the heavy metals there are many other techniques that are either trying to remove or fix the heavy metals in the soils, described in the literature. In this lecture, basics of these techniques (immobilization by solidification/stabilization, extraction by soil washing and electrokinetic treatment and others) and the results of the laboratory workon solidification and electrokinetic treatment carried by the speaker will be presented.

Brief Biography of the Speaker: Assoc. Prof. Dr D. Turer holds a bachelor degree in Geological Engineering from Middle East Technical University (TURKEY), MScand PhD in Geology (2000) from the University of Cincinnati (USA). She has been a faculty member of Geological Engineering Department of Hacettepe University (TURKEY) since 2001. Her research interests includeheavy metal contamination of soils, stabilization/solidification technologies, and environmental geology. She has 10 publications in highly rated ISI journals and 17 in conference proceedings.

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Plenary Lecture 8

On the Link Between Energy Retrofit and Economic Evaluation Priorities



Professor Lamberto Tronchin
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Abstract: The financial crisis of 2008 (and following) caused mainly the construction and real estate sectors to suffer. Moreover, the buildings are responsible of about 40% of incidence on energy emission. The economic crisis did not allow realizing new buildings, and the existing buildings have too much greenhouse emission, that needs to be reduced.
The Energy Retrofit actions could be a way to improve both sectors, because it reduces emission and real estate sector. But Energy Retrofit has some difficulties when it is used to evaluate a better energy, economic and technical solution.
In this paper we present an energy retrofit calculation about an Italian case study: one building typology that is supposed realized in several different periods, with different thermo-physic parameters. For each period it will be applied 4 energy retrofit actions, also will be calculated energy performance of the building, energy cost and economic Simple Pay Back Period (SPB). The aims of paper are to detect whether exists a linear relationship between energy saving increase and SPB decrease for each specific technology, for each different period.

Brief Biography of the Speaker: Dr Lamberto Tronchin is Associate Professor in Environmental Physics from the University of Bologna and is recognised internationally as a leading authority on the subject of sound and acoustics. A pianist himself, with a diploma in piano from the Conservatory of Reggio Emilia, Dr Tronchin's principal area of research has been musical acoustics, room acoustics and signal processing. He is the author of more than 160 papers and was Chair of the Musical Acoustics Group of the Italian Association of Acoustics from 2000 to 2008. Dr Tronchin is a member of the Scientific Committee of the CIARM, the Inter- University Centre of Acoustics and Musical research, has chaired sessions of architectural and musical acoustics during several international symposiums, been a referee for a number of International journals and is Chair of Organising and Scientific Committees of IACMA (International Advanced Course on Musical Acoustics).
He was a visiting researcher at the University of Kobe in Japan, a visiting professor at the University of Graz in Austria and Special honored International Guest at the International Workshop, 'Analysis, Synthesis and Perception of Music Signals', at Jadavpur University of Kolkata, India in 2005. He has chaired the International Advanced Course on Musical Acoustics (IACMA), organised with the European Association of Acoustics, which was held in Bologna, in 2005. In 2008 and 2009 he gave plenary lectures at International Congresses on Acoustics in Vancouver, Prague, Bucharest, Santander, Kos, Malta and Paris. He designed theatres and other buildings, as acoustic consultant, in collaboration with several Architects, among them Richard Meier and Paolo Portoghesi.

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